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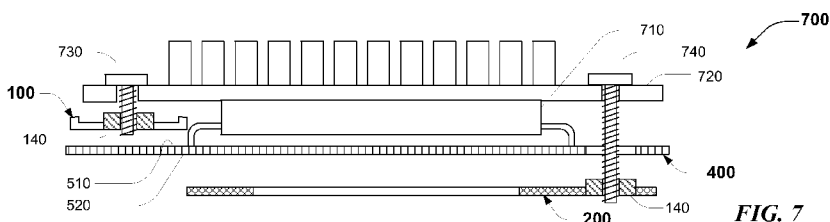
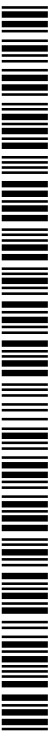


FIG. 7

(57) Abstract: A device mounting system is provided. The device (720) can include a plurality of device mounting posts (730, 740). The system can further include a transition member (100) including an transition mounting feature (150) and at least one receiver (140) adapted to accommodate a first portion of the device mounting features (730). The system can also include a backing member (100) comprising at least one receiver (140) adapted to accommodate the remaining portion of the device mounting features (740) and a transition mounting receiver (240) adapted to accommodate the transition mounting feature (150).



DEVICE MOUNTING SYSTEMS AND METHODS

BACKGROUND OF THE INVENTION

Description of the Related Art

[0001] The ever increasing miniaturization of solid state electronic devices such as central processing units and graphics processing units used within personal computing devices has enabled an ever-greater number of components to be mounted in an ever-decreasing footprint. While many advantages accrue as a result of this miniaturization, one undesirable consequence is the significant quantities of heat generated by these components.

[0002] Heat generated by solid state electronic devices mounted in an enclosure can be problematic, particularly when the enclosure itself is of minimal size, shape or footprint, such as a notebook, laptop, ultraportable or netbook computer. Frequently heat transfer enhancement devices, such as heat sinks having significant heat transfer area within a relatively small footprint are used to dissipate the heat generated by solid state electronic devices mounted in the enclosure. In order to maximize the effectiveness of these heat transfer enhancement devices, they must frequently be mounted proximate the heat generating solid state device. Since heat transfer enhancement devices are mounted to the same substrate as the solid state device, circuits entering and exiting the solid state device must be routed around the heat transfer enhancement device mounting fixture.

SUMMARY OF THE INVENTION

[0003] A device mounting system is provided. The device can include a plurality of device mounting posts. The system can further include a transition member including a transition mounting feature and at least one receiver adapted to accommodate a first portion of the device mounting features. The system can also include a backing member comprising at least one receiver adapted to accommodate the remaining portion of the device mounting features and a

transition mounting receiver adapted to accommodate the transition mounting feature.

[0004] A device mounting method is also provided. The method can include disposing a transition member proximate a substrate comprising a first surface and a second surface. The transition member, including a transition mounting feature and at least one receiver, can be disposed proximate the first surface. A backing member, including at least one receiver and a transition mounting receiver adapted to accommodate the transition mounting feature, can be disposed proximate the second surface of the substrate. A device comprising a plurality of device mounting features can be attached to the transition member and the backing member. A first portion of the device mounting features can be disposed in at least a portion of the receivers disposed on the transition member. The remaining portion of the device mounting features can pass through substrate apertures and can be disposed in at least a portion of the receivers disposed on the backing member.

[0005] A device mounting apparatus is also provided. The apparatus can include a transition member having a plurality of receiver apertures disposed therethrough, a transition mounting feature, and at least one receiver at least partially disposed within at least a portion of the plurality of receiver apertures. The apparatus can further include a backing member having a plurality of apertures disposed therethrough, at least one receiver can be at least partially disposed within at least a portion of the apertures, and a transition mounting receiver can be at least partially disposed within an aperture. The transition mounting receiver can be adapted to accommodate at least a portion of the transition mounting feature.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Advantages of one or more disclosed embodiments may become apparent upon reading the following detailed description and upon reference to the drawings in which:

[0007] Fig. 1A is a perspective view of an exemplary transition member, according to one or more embodiments described herein;

[0008] Fig. 1B is a perspective view of another exemplary transition member, according to one or more embodiments described herein;

[0009] Fig. 2A is an upper perspective view of an exemplary backing member, according to one or more embodiments described herein;

[0010] Fig. 2B is an upper perspective view of another exemplary backing member, according to one or more embodiments described herein;

[0011] Fig. 3 is an upper perspective view of an exemplary device mounting system, according to one or more embodiments described herein;

[0012] Fig. 4. is an upper perspective view of an illustrative substrate, according to one or more embodiments described herein;

[0013] Fig. 5 is an upper perspective view of another exemplary device mounting system, according to one or more embodiments described herein;

[0014] Fig. 6A is a partial sectional view of the exemplary device mounting system depicted in Fig. 5 taken along sectional line 6A-6A, according to one or more embodiments described herein;

[0015] Fig. 6B is a partial sectional view of the exemplary device mounting system depicted in Fig. 5 taken along sectional line 6B-6B, according to one or more embodiments described herein;

[0016] Fig. 7 is a partial sectional view of an exemplary electrical device mounting system, according to one or more embodiments described herein; and

[0017] Fig. 8 is a partial sectional view of another exemplary electrical device mounting system, according to one or more embodiments described herein.

DETAILED DESCRIPTION

[0018] Fig. 1A is a perspective view of an exemplary transition member 100, according to one or more embodiments. The transition member 100 can be a rigid member 110 having any shape or geometry. In one or more embodiments, the rigid member 110 can be any geometric shape or cross section having a high degree of structural rigidity along the longitudinal axis 115 of the structure, for example the C-section shape depicted in Fig. 1.

[0019] A plurality of receiver apertures 120 (two are depicted in Fig. 1) can be disposed in, on, or about the rigid member 110. In one or more embodiments, all or a portion of the plurality of receiver apertures 120 can be adapted to accommodate one or more receivers suitable for the permanent or temporary attachment of one or more devices to the transition member 110. In one or more embodiments, all or a portion of the plurality of receiver apertures 120 can have threads tapped directly into the wall defining the aperture to accommodate the attachment of a threaded device mounting feature. In one or more embodiments, the receiver apertures 120 can have the same or different diameters. In one or more embodiments, the receiver apertures 120 can have a diameter of about 1mm or more; about 3mm or more; about 5mm or more; or about 7mm or more.

[0020] One or more mounting feature apertures 130 can be disposed in, on, or about the rigid member 110. In one or more embodiments, all or a portion of the one or more mounting feature apertures 130 can be adapted to accommodate one or more mounting features suitable for the permanent or temporary attachment of the transition member 100 to a substrate, for example a printed circuit board disposed within an electronic device. In one or more embodiments, the one or more mounting feature apertures 130 can have the same or different diameters. In one or more embodiments, the one or more

apertures 130 can have a diameter of about 1mm or more; about 3mm or more; about 5mm or more; or about 7mm or more.

[0021] The transition member 100 can be of any suitably rigid material. In one or more embodiments, the transition member 100 can be an electrically non-conductive material or other similar or related materials unsuitable for the transmission of an electric current, *i.e.* an insulator. In one or more embodiments, the transition member 100 can be of a material having a high thermal conductivity. In one or more specific embodiments, the transition member 100 can be a fiberglass member, a carbon fiber member, a reinforced phenolic resin member, or the like.

[0022] Fig. 1B is a perspective view of another exemplary transition member 100, according to one or more embodiments. In one or more embodiments, one or more receivers 140 can be disposed in at least a portion of the receiver apertures 120. In one or more embodiments, at least a portion of the one or more receivers 140 can be adapted to accommodate the temporary or permanent attachment of a device mounting feature therein. In one or more embodiments, all or a portion of the one or more receivers 140 can be an elastomeric material to accommodate a frictional attachment of the device mounting feature, for example a post. In one or more embodiments, all or a portion of the one or more receivers 140 can be a resilient material to provide a solid interface to accommodate the attachment of a threaded device mounting feature, for example a screw or stud. In one or more embodiments, all or a portion of the one or more receivers 140 can be an electrically non-conductive material to accommodate the attachment of a deformable device mounting feature, for example a rivet.

[0023] A transition mounting feature 150 can be disposed partially or completely within each of the mounting feature apertures 130. In one or more embodiments, the transition mounting feature 150 can include, but is not limited to a post disposed partially or completely within the mounting feature aperture 130 as depicted in Fig. 1B. In one or more embodiments, the transition

mounting feature 150 can be a standoff or similar insert adapted to accommodate the partial or complete insertion of a transition mounting feature 150.

[0024] Fig. 2A is an upper perspective view of an exemplary backing member 200, according to one or more embodiments. The backing member 200 can include a rigid member 210 having any shape or geometry. In one or more embodiments, the rigid member 210 can be any geometric shape or cross section having a high degree of structural rigidity, for example the ring-shaped geometry surrounding a central aperture 230 as depicted in Fig. 2A. Other equally efficacious shapes and geometries for the backing member 200 are possible and are included within the scope of this disclosure as one or more additional embodiments.

[0025] A plurality of apertures 220 (three are depicted in Fig. 2A) can be disposed in, on, or about the rigid member 210. In one or more embodiments, all or a portion of the plurality of the apertures 220 can be adapted to accommodate one or more receivers suitable for the permanent or temporary attachment of one or more devices to the transition member 210. In one or more embodiments, all or a portion of the plurality of the apertures 220 can have threads tapped directly into the wall defining the aperture 220 to accommodate the attachment of a threaded device mounting feature. In one or more embodiments, all or a portion of the plurality of the apertures 220 can have the same or different diameters. In one or more embodiments, the one or more apertures 220 can have a diameter of about 1mm or more; about 3mm or more; about 5mm or more; or about 7mm or more.

[0026] Fig. 2B is an upper perspective view of another exemplary backing member 200, according to one or more embodiments. In one or more embodiments, receivers 140 can be disposed in at least a portion of the one or more apertures 220. In one or more embodiments, as described in detail above with respect to Fig. 1B, at least a portion of the receivers 140 can be adapted to

accommodate the temporary or permanent attachment of a device mounting feature therein.

[0027] In one or more embodiments, at least one transition mounting receiver 240 can be disposed in at least a portion of the apertures 220. In one or more embodiments, the at least one transition mounting receiver 240 can be adapted to accommodate the temporary or permanent attachment of a transition mounting feature 150 thereto. In one or more embodiments, the transition mounting receiver 240 can be an elastomeric material adapted to accommodate the frictional attachment of the transition mounting feature 150, for example a transition mounting post. In one or more embodiments, the transition mounting receiver 240 can be a resilient material adapted to provide a solid interface to accommodate the attachment of a threaded transition mounting feature 150, for example a screw or a stud. In one or more embodiments, the transition mounting receiver 240 can be an electrically non-conductive material adapted to accommodate the attachment of a deformable transition mounting feature 150, for example a rivet.

[0028] Fig. 3 is an upper perspective view of an exemplary device mounting system 300, according to one or more embodiments. In one or more embodiments, the system 300 can include an exemplary transition member 100 attached to an exemplary backing member 200 using one or more transition mounting features 150 attached to one or more transition mounting receivers 240. In one or more embodiments, the one or more transition mounting features 150 can include, but are not limited to, one or more friction fasteners such as a post, one or more threaded fasteners such as a screw, or one or more deformable fasteners such as a rivet. The one or more transition mounting receivers 240 can include, but are not limited to, threads disposed about the exterior surface of the aperture 220, one or more elastomeric materials adapted to accommodate the frictional attachment of the transition mounting feature 150, one or more resilient materials adapted to provide a solid interface to accommodate the attachment of a threaded transition mounting

feature 150, or one or more electrically non-conductive material adapted to accommodate the attachment of a deformable transition mounting feature 150.

[0029] As depicted in Fig. 3, in one or more specific embodiments, the transition mounting feature 150 can include a post, and the transition member 100 can be attached to the backing member 200 by disposing the post within an appropriate transition mounting receiver 240, such as an elastomeric receiver 240 to which the post 150 can be attached using frictional forces. In one or more embodiments, a male-threaded transition mounting feature 150 such as a screw can be used in conjunction with a complimentary female-threaded transition mounting receiver 240 to permit the threaded attachment of the transition member 100 to the backing member 200. Similarly, in one or more embodiments, a deformable transition mounting feature 150 such as a rivet can be used in conjunction with a resilient transition mounting receiver 240 to permit the permanent attachment of the transition member 100 to the backing member 200.

[0030] After the attachment of the transition member 100 to the backing member 200, a plurality of receivers 140 can be disposed about the attached components. As depicted in Fig. 3, an equal number (two) of receivers 140 can be disposed on the transition member 100 and the backing member 200. In one or more embodiments, the receivers 140 can be unequally distributed between the transition member 100 and the backing member 200, for example two (2) receivers 140 can be distributed on the transition member and four (4) receivers 140 can be distributed on the backing member 200. In one or more embodiments, any number of receivers 140 can be distributed on the transition member 100 and any number of receivers 140 can be distributed on the backing member 200.

[0031] Fig 4. is an upper perspective view of an illustrative substrate 400, according to one or more embodiments. In one or more embodiments, the substrate 400 can include a rigid member 410 having a plurality of substrate apertures 420 disposed therein (three such substrate apertures 420 are

depicted in Fig. 4). In one or more embodiments, all or a portion of the one or more substrate apertures 420 can be adapted to accommodate the passage of one or more mounting features, for example the transition mounting feature 150, through the rigid member 410. In one or more embodiments, the one or more substrate apertures 420 can have a diameter of about 1mm or more; about 3mm or more; about 5mm or more; or about 7mm or more.

[0032] The substrate 400 can include any suitably rigid structure, including but not limited to, a single or multi-layer printed circuit board having one or more board-mount electrical devices attached thereto. In one or more embodiments, the substrate 400 can include a single or multi-layer printed circuit board having one or more board-mount and one or more socket-mount electrical devices attached thereto. In one or more embodiments, the substrate 400 can include a printed circuit board disposed partially or completely within a computing device, for example a computing device motherboard; a computing device daughter board; a computing device video board; and a computing device peripheral board.

[0033] Fig. 5 is an upper perspective view of another exemplary device mounting system 500, according to one or more embodiments. In one or more embodiments, the substrate 400 can be a substantially planar, rigid, member having a first ("upper") surface 510 and a second ("lower") surface 520. In one or more embodiments, the transition member 100 can be disposed proximate the upper surface 510 of the substrate 400 and the backing member 200 can be disposed proximate the lower surface 520 of the substrate 400.

[0034] The terms "upper," "lower" and other like terms used herein refer to relative positions to another and are not intended, nor should be interpreted, to denote a particular absolute direction or spatial orientation. For example, a feature described as being on the "lower" surface of a device could be on the "upper" surface or a "side" surface of the device if the device is rotated or inverted; such rotation or inversion is envisioned to be within the scope of one or more claimed embodiments described herein.

[0035] All or a portion of the receivers 140 can be disposed proximate the lower surface 520 of the substrate 400, located proximate one or more substrate apertures 420. Positioning all or a portion of the receivers 140 proximate one or more substrate apertures can permit the disposal of one or more mounting features within the receivers 140 from the upper surface 510 of the substrate 400.

[0036] The transition member 100 can be attached to the backing member 200 by the passage of a single transition mounting feature 150 through the substrate aperture 420. After passage through the substrate aperture 420, the transition mounting feature 150 can engage the transition mounting receiver 240 disposed in the backing member 200. In one or more specific embodiments, use of the transition member 100 can reduce the number substrate apertures 420 required to attach a device proximate the upper surface 510 of the substrate 400 to the backing member 200. Reducing the number of substrate apertures 420 can, for example, increase the substrate available for the routing of additional circuitry that would have previously been hindered by the additional substrate apertures 420 in the absence of the transition member 100.

[0037] Fig. 6A is a partial sectional view of the exemplary device mounting system 500 depicted in Fig. 5 taken along sectional line 6A-6A, according to one or more embodiments. Fig. 6A provides a clearer view of an exemplary spatial relationship between an illustrative transition member 100, an illustrative backing member 200, and an illustrative substrate 400. In one or more embodiments, the transition member 100 can be disposed proximate the upper surface 510 of the substrate 400 while the backing member 200 can be disposed proximate the lower surface 520 of the substrate 400.

[0038] As depicted in Fig. 6A, in one or more embodiments, all or a portion of the receivers 140 disposed on backing member 200 can be located proximate a substrate aperture 420. In one or more embodiments, all or a portion of the receivers 140 disposed on the transition member 100 can be disposed distal from all or a portion of the substrate apertures 420.

[0039] Fig. 6B is a partial sectional view of the exemplary device mounting system 500 depicted in Fig. 5 taken along sectional line 6B-6B, according to one or more embodiments. Fig. 6B provides a clearer view of an exemplary spatial relationship between an illustrative transition member 100, an illustrative backing member 200, and an illustrative substrate 400. In one or more embodiments, the transition member 100 can be disposed proximate the upper surface 510 of the substrate 400 while the backing member 200 can be disposed proximate the lower surface 520 of the substrate 400.

[0040] As depicted in Fig. 6B, in one or more embodiments, all or a portion of the transition mounting feature 150 can pass through one or more substrate apertures 420. After passing through the substrate aperture 420, all or a portion of the transition mounting feature 150 can be disposed proximate or otherwise attached to all or a portion of a transition mounting receiver 240.

[0041] Fig. 7 is a partial sectional view of an exemplary device mounting system 700, according to one or more embodiments. In one or more embodiments, the substrate 400 can include one or more circuit boards disposed at least partially with a computing device. In one or more specific embodiments, the substrate 400 can include, but is not limited to, a computing device motherboard; a computing device daughter board; a computing device video board; and a computing device peripheral board.

[0042] In one or more embodiments, a heat-generating device 710 can be mounted or otherwise attached or communicatively coupled to the substrate 400. In one or more embodiments, the heat-generating device 710 can be a single component device, or system. In one or more embodiments, the heat generating device 710 can be a multi-component device or system. In one or more embodiments, the heat generating device 710 can be an electronic device. In one or more embodiments, the heat generating device 710 can include, but is not limited to, an integrated circuit such as a central processing unit ("CPU"); a graphical processing unit ("GPU"); a volatile memory storage unit; and a non-volatile memory storage unit.

[0043] A device 720 can be disposed proximate the heat-generating device 710. In one or more embodiments, the device 720 can include a heat dissipating device, for example a passive finned cooler, a forced air finned cooler, a stacked plate cooler, an extruded fin cooler, or any other device in the art suitable for transferring, transporting, or otherwise dissipating all or a portion of the heat generated by the heat-generating device 710. In one or more embodiments, the device 720 can be attached to the electronic device 710 using heat transfer mastic, thermal foil, or the like. In one or more embodiments, the device 720 can be integrally formed with the heat-generating device 710.

[0044] In one or more embodiments, a plurality of device mounting features 730, 740 can be disposed in, on, or about the device 720. In one or more embodiments, all or a portion of the device mounting features 730, 740 can be attached to all or a portion of the receivers 140 disposed in, on, or about the transition member 100 and the backing member 200. In one or more specific embodiments, a first portion of device mounting features 730 can be attached to or otherwise disposed in, on, or about, the receivers 140 disposed on the transition member 100. In one or more specific embodiments, the remaining portion of device mounting features 740 can pass through one or more substrate apertures 420 and be attached to or otherwise disposed in, on, or about, the receivers 140 disposed on the backing member 200.

[0045] Fig. 8 is a partial sectional view of an exemplary device mounting system 800, according to one or more embodiments. In one or more embodiments, the substrate 400 can include one or more circuit boards disposed at least partially with a computing device. At least a portion of a device 810 can be disposed proximate the heat-generating device 710.

[0046] A device 810 can be disposed proximate the heat-generating device 710. In one or more embodiments, the device 810 can include a heat transfer device, such as a heat pipe, heat spreader, or any other device in the art suitable for transferring, transporting, or otherwise dissipating all or a portion of the heat

generated by the heat-generating device 710. In one or more embodiments, the device 810 can be attached to the electronic device 710 using heat transfer mastic, thermal foil, or the like. In one or more embodiments, all or a portion of the device 810 can be integrally formed with the heat-generating device 710.

[0047] Certain embodiments and features have been described using a set of numerical upper limits and a set of numerical lower limits. It should be appreciated that ranges from any lower limit to any upper limit are contemplated unless otherwise indicated. Certain lower limits, upper limits and ranges appear in one or more claims below. All numerical values are “about” or “approximately” the indicated value, and take into account experimental error and variations that would be expected by a person having ordinary skill in the art.

[0048] While the foregoing is directed to embodiments of the present invention, other and further embodiments of the invention may be devised without departing from the basic scope thereof, and the scope thereof is determined by the claims that follow.

CLAIMS

What is claimed is:

1. A device mounting system comprising:
 - a device comprising a plurality of device mounting features 730, 740;
 - an transition member 100 comprising:
 - an transition mounting feature 150; and
 - at least one receiver 140 adapted to accommodate a first portion of the device mounting features 730; and
 - a backing member 200 comprising:
 - at least one receiver 140 adapted to accommodate a remaining portion of the device mounting features 740; and
 - a transition mounting receiver 240 adapted to accommodate the transition mounting feature.
2. The system of claim 1, further comprising:
 - a substrate 400 comprising a first surface 510 and a second surface 520;
 - wherein at least one aperture 220 is adapted to accommodate the remaining portion of the device mounting features 740 extends from the first surface to the second surface;
 - wherein an aperture 220 is adapted to accommodate the transition mounting feature 150 extends from the first surface to the second surface;
 - wherein the transition member 100 is disposed proximate the first surface; and
 - wherein the backing member 200 is disposed proximate the second surface.
3. The systems of claims 1 and 2, wherein:
 - the plurality of device mounting features 730, 740 comprises four device mounting features;

the first portion of device mounting features 730 comprises two device mounting features; and

the remaining portion of device mounting features 740 comprises two device mounting features.

4. The system of claims 1 and 2, wherein at least a portion of the device 720 comprises a heat dissipating device disposed proximate one or more heat-generating devices 710.
5. The system of claim 4, wherein the one or more heat-generating devices 710 is an integrated circuit selected from the group of integrated circuits consisting of: a central processing unit ("CPU"); a graphical processing unit ("GPU"); a volatile memory storage unit; and a non-volatile memory storage unit.
6. The system of claims 1 and 2, wherein at least a portion of the device 720 comprises a heat transfer device 810 disposed proximate the one or more heat-generating devices 710.
7. The system of claim 2, wherein at least a portion of the substrate 400 comprises a circuit board selected from the group of circuit boards consisting of: a computing device motherboard; a computing device daughter board; a computing device video board; and a computing device peripheral board.
8. The system of claim 1,
wherein at least a portion of the device mounting features 730, 740 comprise male-threaded fasteners; and
wherein at least a portion of the receivers 140 comprise a resilient material having a complimentary female thread.
9. The system of claim 1,

wherein at least a portion of the device mounting features 730, 740 comprise deformable fasteners; and

wherein at least a portion of the receivers 140 comprise an electrically non-conductive material.

10. A device mounting method comprising:

disposing a transition member 100 proximate a substrate 400 comprising a first surface 510 and a second surface 520;

wherein the transition member is disposed proximate the first surface; and

wherein the transition member comprises:

a transition mounting feature 150; and

at least one receiver 140;

disposing a backing member 200 proximate the second surface of the substrate;

wherein the backing member comprises:

at least one receiver 140; and

an transition mounting receiver 240 adapted to accommodate the transition mounting feature; and

attaching a device 720 comprising a plurality of device mounting features 730, 740 to the transition member and the backing member;

wherein a first portion of the device mounting features 730 are disposed in at least a portion of the receivers 140 disposed on the transition member 100; and

wherein the remaining portion of the device mounting features 740 pass through substrate apertures 420 and are disposed in at least a portion of the receivers 140 disposed on the backing member 200.

11. The method of claim 10, wherein attaching the device comprises:

non-detachably attaching at least a portion of the device mounting features 730, 740 to at least a portion of the receivers 140;

wherein the device mounting features 730, 740 comprise deformable features; and

wherein the receivers 140 comprise an electrically non-conductive resilient material.

12. The method of claim 10, wherein attaching the device comprises:
 - threadedly attaching at least a portion of the device mounting features 730, 740 to at least a portion of the receivers 140;
 - wherein the device mounting features 730, 740 comprise male-threaded features; and
 - wherein the receivers 140 comprise a resilient material having a complimentary female-thread.
13. A device mounting apparatus comprising:
 - a transition member 100 comprising:
 - a plurality of receiver apertures 120 disposed therethrough;
 - a transition mounting feature 150; and
 - at least one receiver 140 at least partially disposed within at least a portion of the plurality of receiver apertures 120; and
 - a backing member 200 comprising:
 - a plurality of apertures 220 disposed therethrough;
 - at least one receiver 140 is at least partially disposed within at least a portion of the apertures; and
 - a transition mounting receiver 240 at least partially disposed within an aperture, the transition mounting receiver adapted to accommodate at least a portion of the transition mounting feature 150.
14. The apparatus of claim 13 further comprising:
 - a device 720 comprising a plurality of device mounting features 730, 740;

wherein at least a portion of the device mounting features 730, 740 comprise male-threaded fasteners; and

wherein at least a portion of the receivers 140 comprise a resilient material having a complimentary female thread.

15. The apparatus of claim 13 further comprising:
a device 720 comprising a plurality of device mounting features 730, 740;
wherein at least a portion of the device mounting features 730, 740 comprise deformable fasteners; and
wherein at least a portion of the receivers 140 comprise an electrically non-conductive material.

AMENDED CLAIMS
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CLAIMS

What is claimed is:

1. A device mounting system comprising:
 - a device comprising a plurality of device mounting features 730, 740;
 - an transition member 100 comprising:
 - an transition mounting feature 150; and
 - at least one receiver 140 adapted to accommodate a first portion of the device mounting features 730; and
 - a backing member 200 comprising:
 - at least one receiver 140 adapted to accommodate a remaining portion of the device mounting features 740; and
 - a transition mounting receiver 240 adapted to accommodate the transition mounting feature.
2. The system of claim 1, further comprising:
 - a substrate 400 comprising a first surface 510 and a second surface 520;
 - wherein at least one aperture 220 is adapted to accommodate the remaining portion of the device mounting features 740 extends from the first surface to the second surface;
 - wherein an aperture 220 is adapted to accommodate the transition mounting feature 150 extends from the first surface to the second surface;
 - wherein the transition member 100 is disposed proximate the first surface; and
 - wherein the backing member 200 is disposed proximate the second surface.
3. The systems of claims 1 or 2, wherein:
 - the plurality of device mounting features 730, 740 comprises four device mounting features;

the first portion of device mounting features 730 comprises two device mounting features; and

the remaining portion of device mounting features 740 comprises two device mounting features.

4. The system of claims 1 or 2, wherein at least a portion of the device 720 comprises a heat dissipating device disposed proximate one or more heat-generating devices 710.
5. The system of claim 4, wherein the one or more heat-generating devices 710 is an integrated circuit selected from the group of integrated circuits consisting of: a central processing unit ("CPU"); a graphical processing unit ("GPU"); a volatile memory storage unit; and a non-volatile memory storage unit.
6. The system of claims 1 or 2, wherein at least a portion of the device 720 comprises a heat transfer device 810 disposed proximate the one or more heat-generating devices 710.
7. The system of claim 2, wherein at least a portion of the substrate 400 comprises a circuit board selected from the group of circuit boards consisting of: a computing device motherboard; a computing device daughter board; a computing device video board; and a computing device peripheral board.
8. The system of claim 1,
wherein at least a portion of the device mounting features 730, 740 comprise male-threaded fasteners; and
wherein at least a portion of the receivers 140 comprise a resilient material having a complimentary female thread.
9. The system of claim 1,

wherein at least a portion of the device mounting features 730, 740 comprise deformable fasteners; and

wherein at least a portion of the receivers 140 comprise an electrically non-conductive material.

10. A device mounting method comprising:

disposing a transition member 100 proximate a substrate 400 comprising a first surface 510 and a second surface 520;

wherein the transition member is disposed proximate the first surface; and

wherein the transition member comprises:

a transition mounting feature 150; and

at least one receiver 140;

disposing a backing member 200 proximate the second surface of the substrate;

wherein the backing member comprises:

at least one receiver 140; and

an transition mounting receiver 240 adapted to accommodate the transition mounting feature; and

attaching a device 720 comprising a plurality of device mounting features 730, 740 to the transition member and the backing member;

wherein a first portion of the device mounting features 730 are disposed in at least a portion of the receivers 140 disposed on the transition member 100; and

wherein the remaining portion of the device mounting features 740 pass through substrate apertures 420 and are disposed in at least a portion of the receivers 140 disposed on the backing member 200.

11. The method of claim 10, wherein attaching the device comprises:

non-detachably attaching at least a portion of the device mounting features 730, 740 to at least a portion of the receivers 140;

wherein the device mounting features 730, 740 comprise deformable features; and

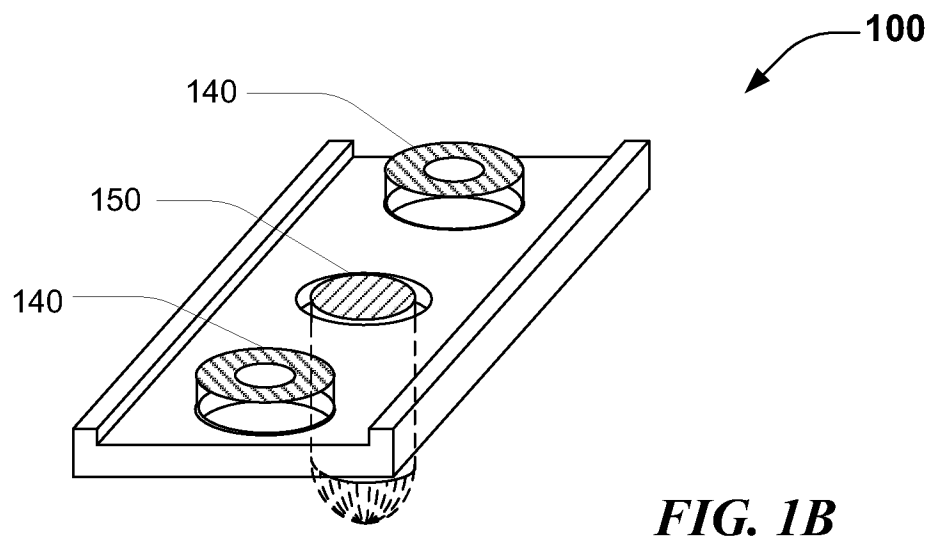
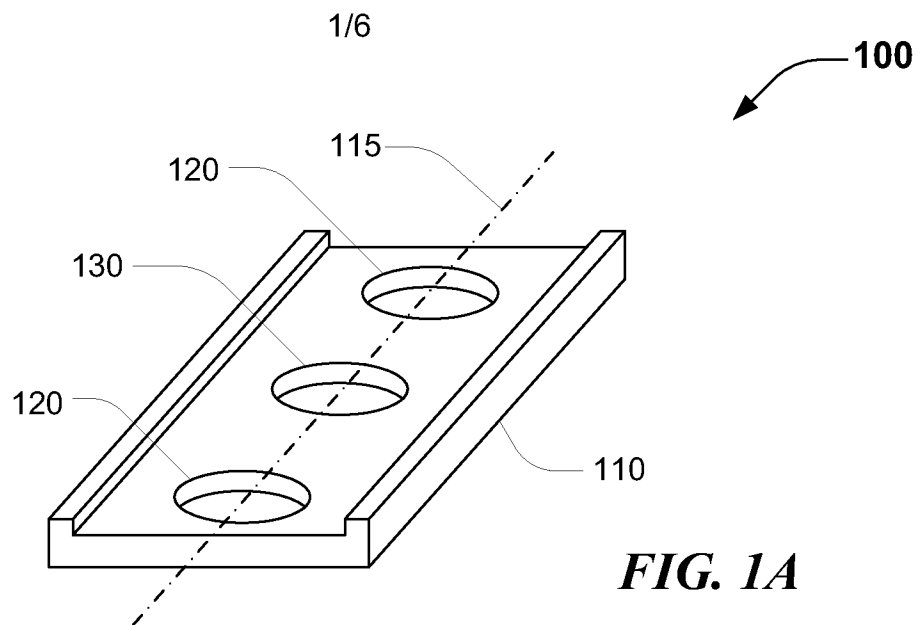
wherein the receivers 140 comprise an electrically non-conductive resilient material.

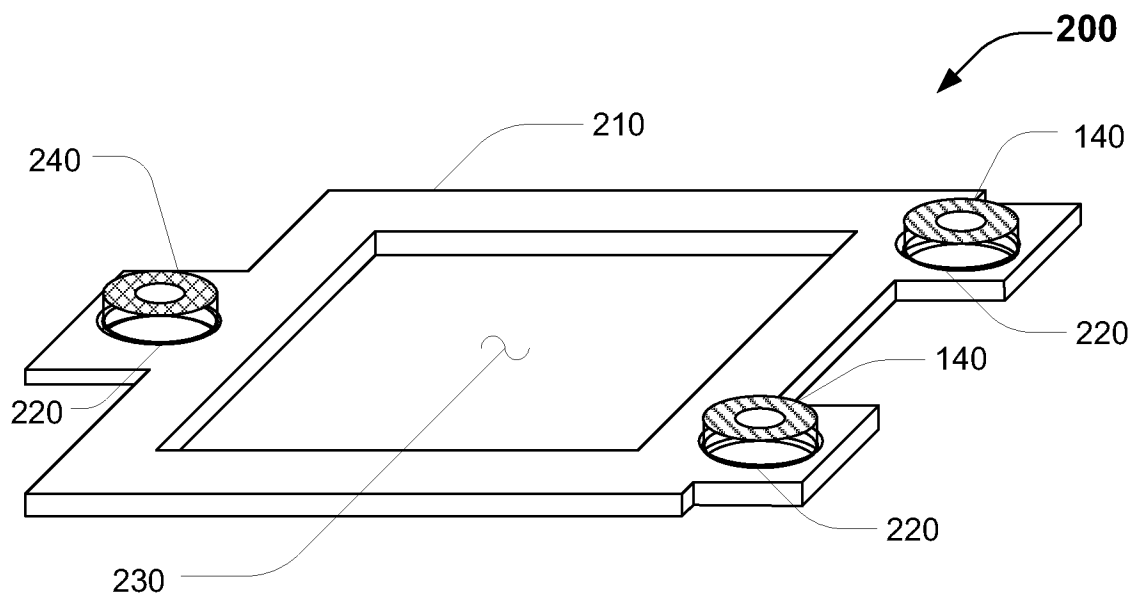
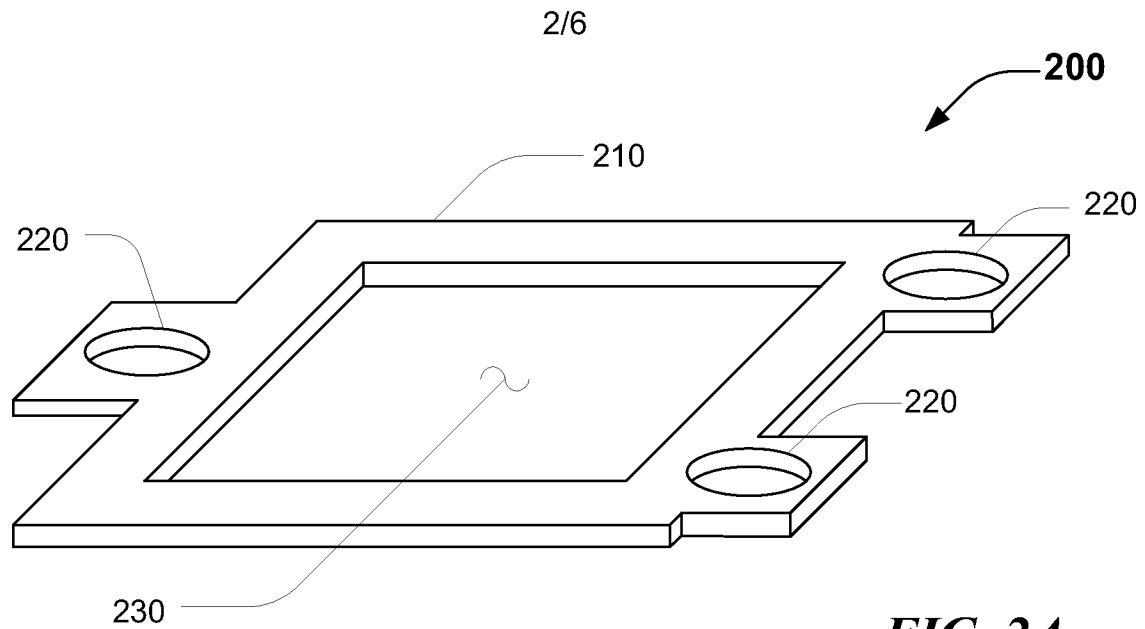
12. The method of claim 10, wherein attaching the device comprises:
 - threadedly attaching at least a portion of the device mounting features 730, 740 to at least a portion of the receivers 140;
 - wherein the device mounting features 730, 740 comprise male-threaded features; and
 - wherein the receivers 140 comprise a resilient material having a complimentary female-thread.
13. A device mounting apparatus comprising:
 - a transition member 100 comprising:
 - a plurality of receiver apertures 120 disposed therethrough;
 - a transition mounting feature 150; and
 - at least one receiver 140 at least partially disposed within at least a portion of the plurality of receiver apertures 120; and
 - a backing member 200 comprising:
 - a plurality of apertures 220 disposed therethrough;
 - at least one receiver 140 is at least partially disposed within at least a portion of the apertures; and
 - a transition mounting receiver 240 at least partially disposed within an aperture, the transition mounting receiver adapted to accommodate at least a portion of the transition mounting feature 150.
14. The apparatus of claim 13 further comprising:
 - a device 720 comprising a plurality of device mounting features 730, 740;

wherein at least a portion of the device mounting features 730, 740 comprise male-threaded fasteners; and

wherein at least a portion of the receivers 140 comprise a resilient material having a complimentary female thread.

15. The apparatus of claim 13 further comprising:
 - a device 720 comprising a plurality of device mounting features 730, 740;
 - wherein at least a portion of the device mounting features 730, 740 comprise deformable fasteners; and
 - wherein at least a portion of the receivers 140 comprise an electrically non-conductive material.





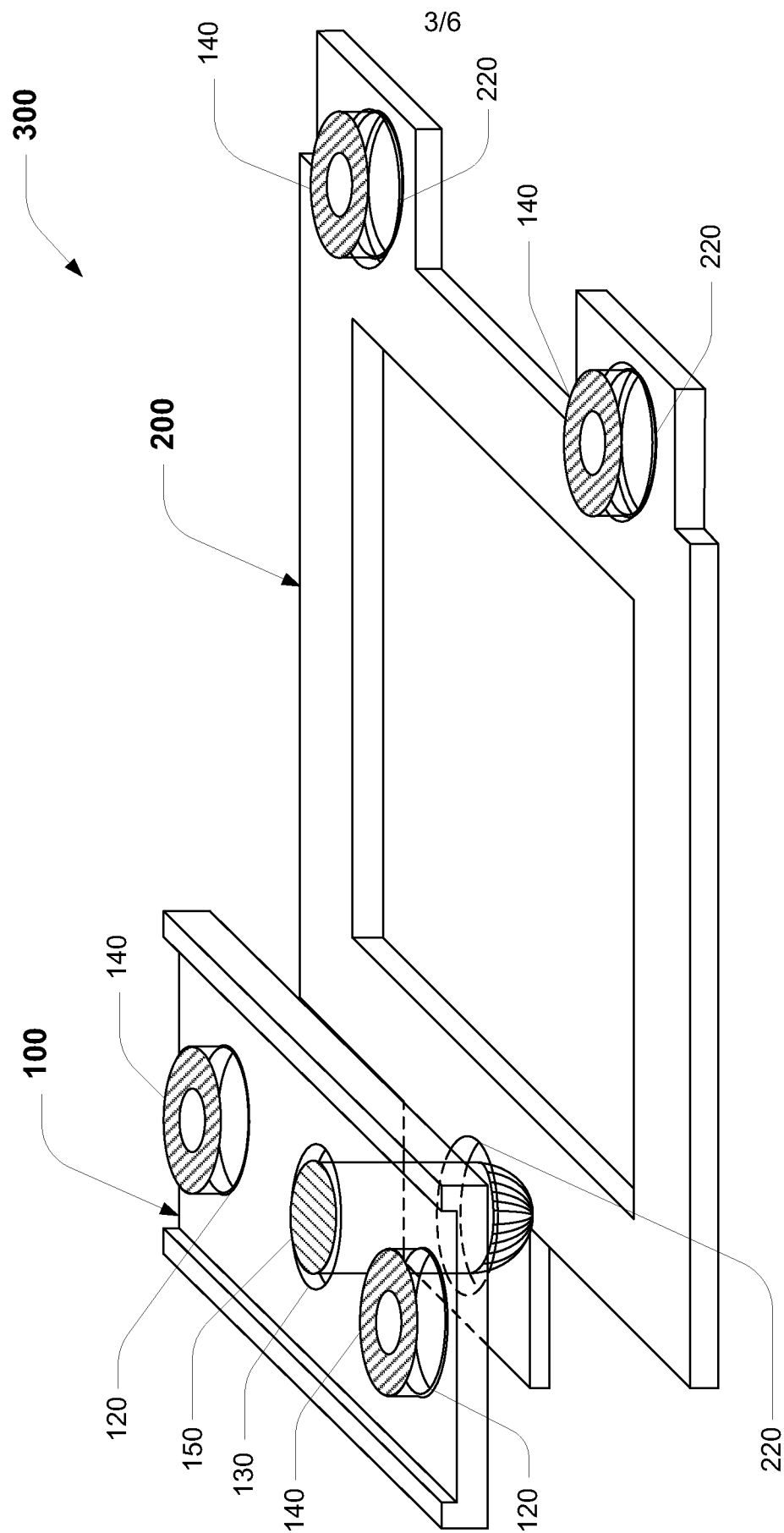
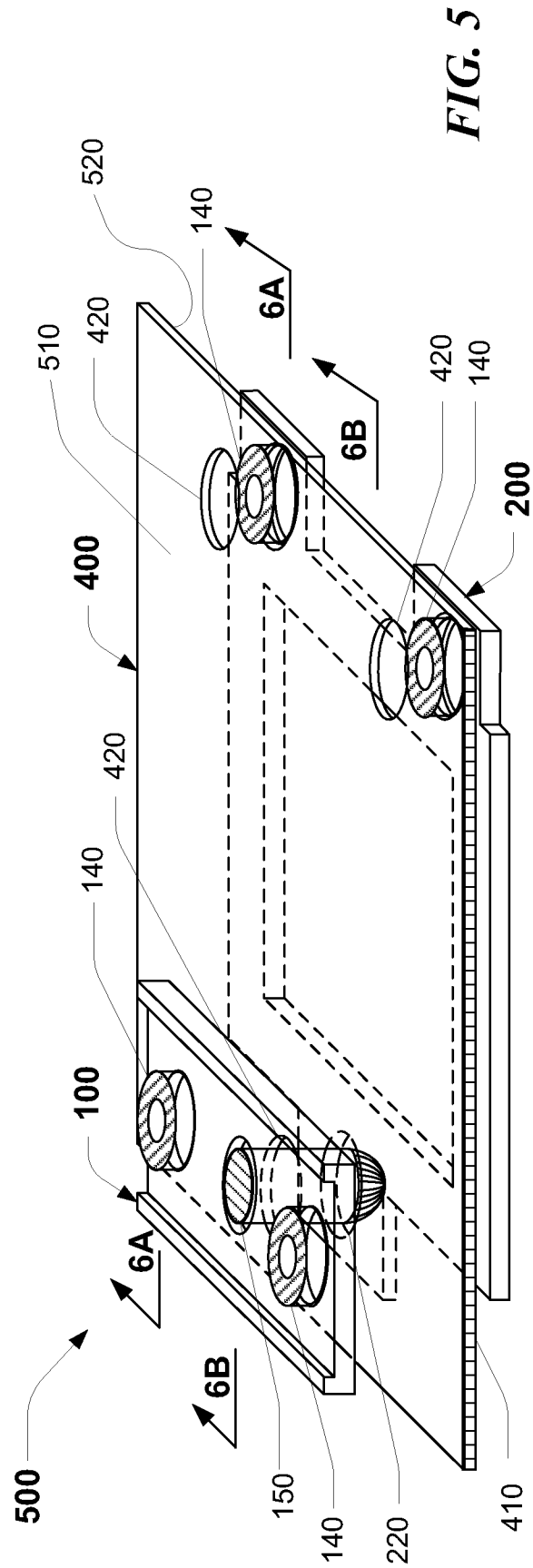
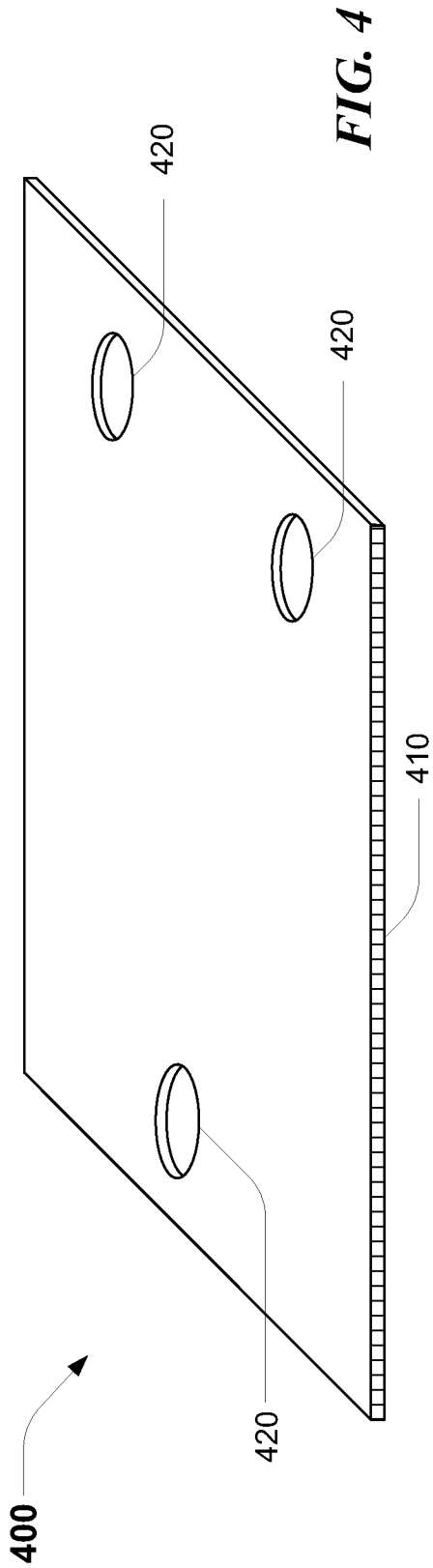
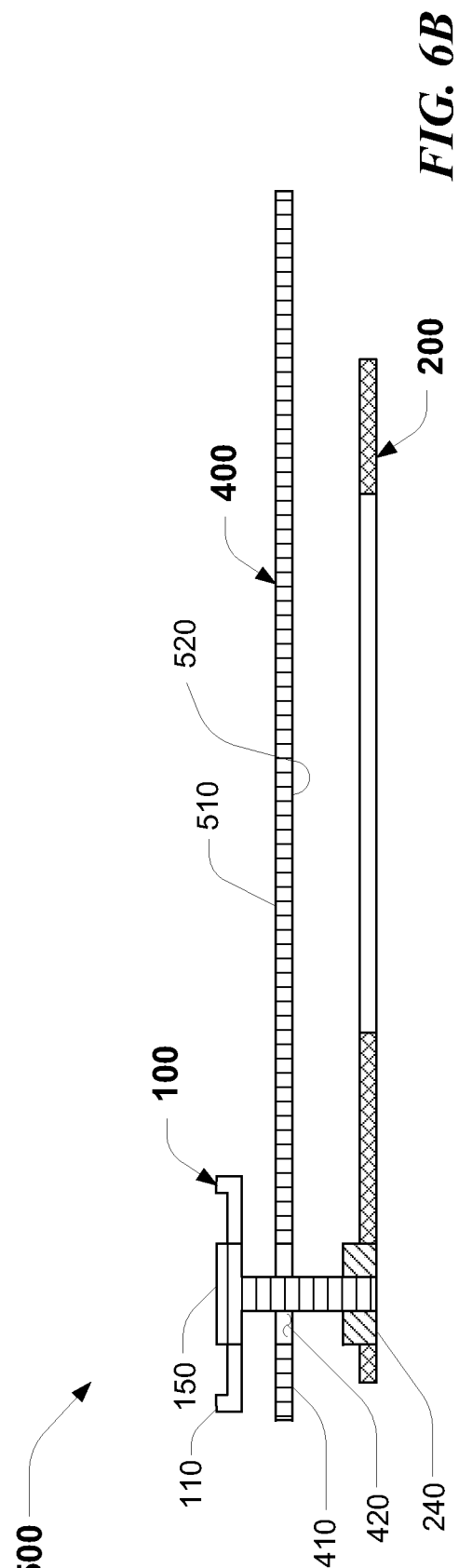
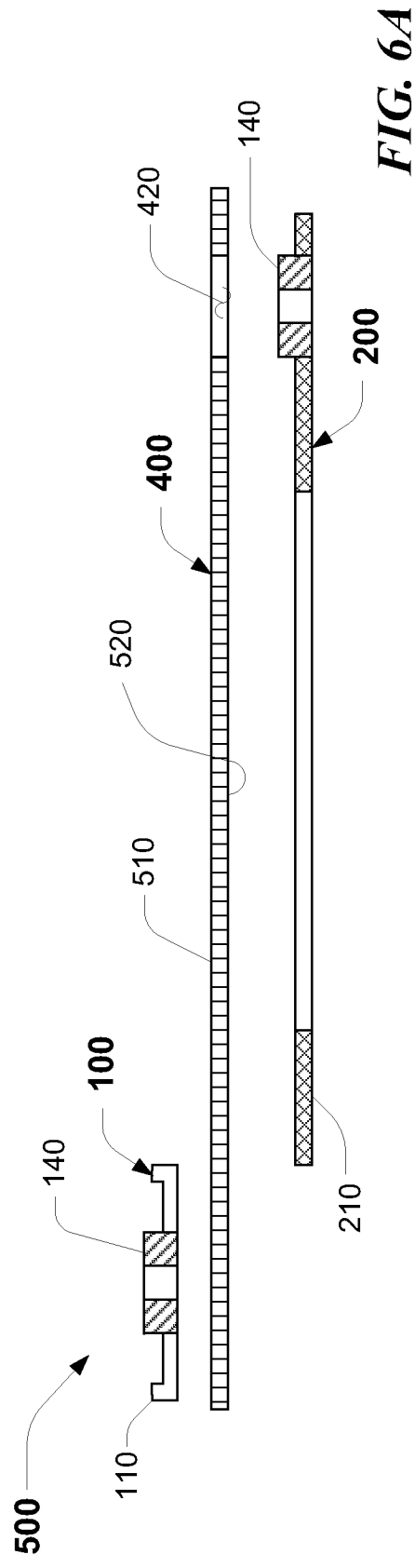
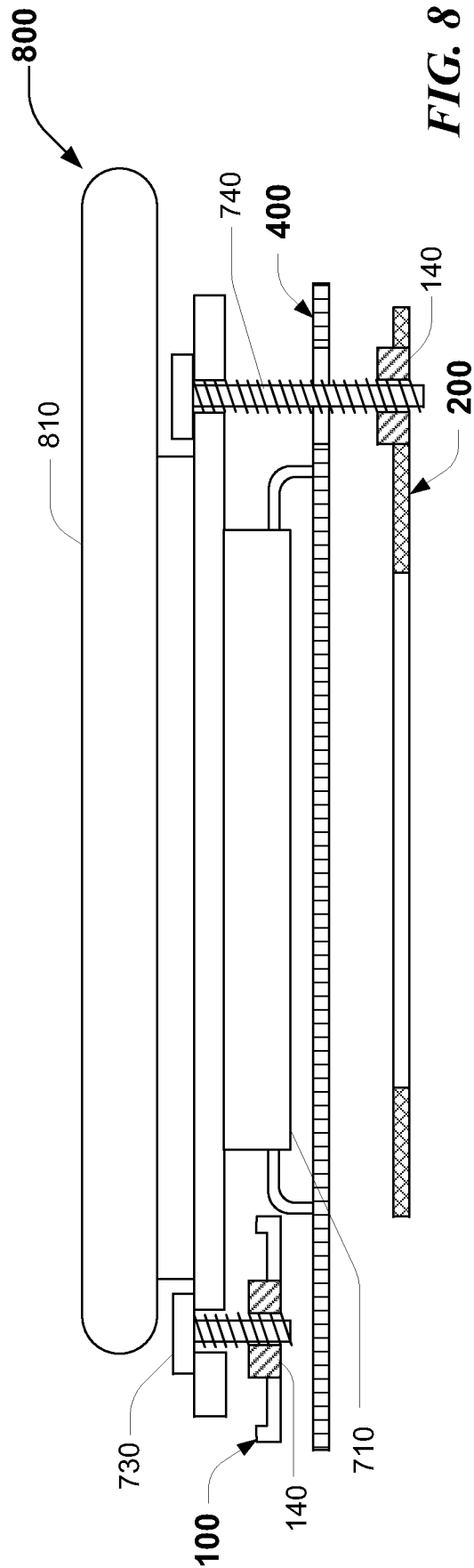
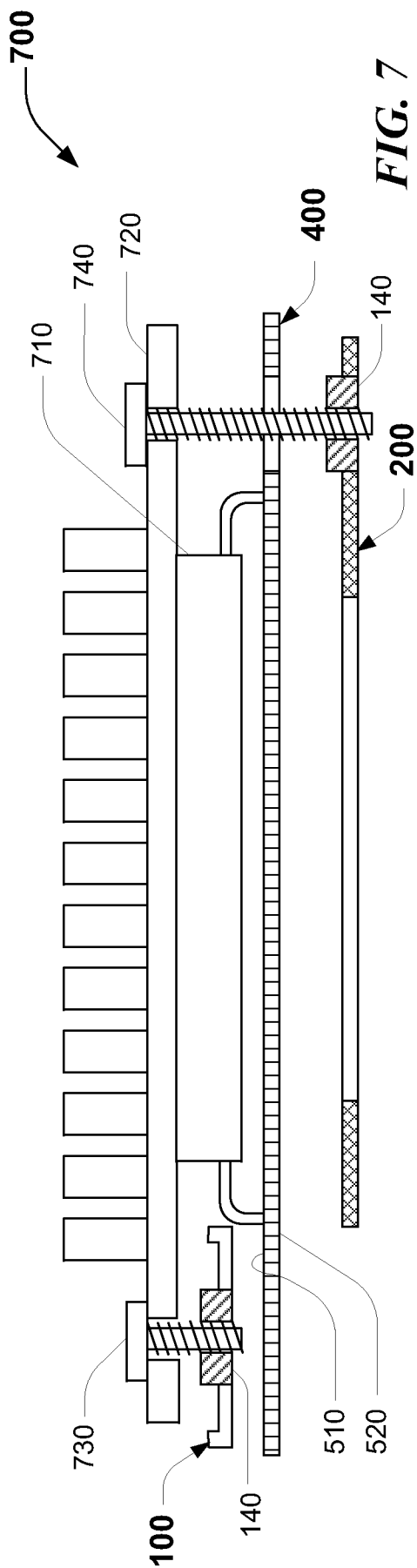


FIG. 3







INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/054233**A. CLASSIFICATION OF SUBJECT MATTER****H05K 13/04(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H05K 13/04; B29C 43/18; H01R 9/09; H05K 1/14; H05K 3/34

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

(Chinese Patents and application for patent)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords:board,substrate,mounting,heat

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2000-357866 A (LUCENT TECHNOLOG INC) 26 December 2000 See paragraph [0030] - paragraph [0034] and figure 5.	1-2, 7-15
A	JP 2000-049447 A (SONY CORP) 18 February 2000 See paragraph [0019] - paragraph [0021] and figure 1.	1-2, 7-15
A	JP 06-275328 A (FUJII ELELCTROCHEM CO LTD) 30 September 1994 See paragraph [0014] - paragraph [0016] and figures 2, 3.	1-2, 7-15

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

18 MAY 2010 (18.05.2010)

Date of mailing of the international search report

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Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2009/054233**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 5
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
Claim 5 is unclear in that it depends on claim 4 not complying with PCT Rule 6.4(a).
3. ☒ Claims Nos.: 3,4,6
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2009/054233

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2000-357866 A	26.12.2000	EP 1043920 A2 US 6189203 B1	11.10.2000 20.02.2001
JP 2000-049447 A	18.02.2000	None	
JP 06-275328 A	30.09.1994	None	